

FINAL REPORT
JULY 1994

REPORT NO. 94-22

750-POUND M117 BOMBS
IN A COMMERCIAL ISO
SIDE-OPENING CONTAINER
TRANSPORTABILITY TESTS

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Prepared for:
U.S. Army Defense Ammunition
Center and School
ATTN: SMCAC-DET
Savanna, IL 61074-9639

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VALIDATION ENGINEERING DIVISION
SAVANNA, ILLINOIS 61074-9639



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| <p>The U.S. Army Defense Ammunition Center and School (USADACS), Validation Engineering Division (SMCAC-DEV), was tasked by USADACS, Transportation Engineering Division (SMCAC-DET), to test a reduced wooden dunnage loading and bracing procedure for 750-pound M117 bombs with fins on wooden pallets in a commercial International Organization for Standardization (ISO) side-opening container. Rail impact, road, and container tilt tests were performed on a loaded commercial ISO side-opening container. The container was rail impact tested on a Container-on-flatcar (COFC) and Trailer-on-flatcar (TOFC). Road tests were performed with the container mounted on a 20-foot container chassis. Due to the Shipboard Transportation Simulator (STS) being inoperable, the container was tilted 80 degrees to the back wall with a crane. There was no damage to the load or the container as a result of these tests; therefore, the load is acceptable for transportation in all surface modes.</p> | | | | | |
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**U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL
VALIDATION ENGINEERING DIVISION
SAVANNA, IL 61074-9639**

REPORT NO. 94-22

**750-POUND M117 BOMBS IN A COMMERCIAL ISO
SIDE-OPENING CONTAINER TRANSPORTABILITY TESTS**

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PART 1

INTRODUCTION

A. BACKGROUND. The U.S. Army Defense Ammunition Center and School (USADACS), Validation Engineering Division (SMCAC-DEV), was tasked by USADACS, Transportation Engineering Division (SMCAC-DET), to test a reduced wooden dunnage loading and bracing procedure for 750-pound M117 bombs, complete round in a commercial International Organization for Standardization (ISO) side-opening container.

B. AUTHORITY. This test was conducted IAW mission responsibilities delegated by the U.S. Army Armament, Munitions and Chemical Command (AMCCOM), Rock Island, IL 61299-6000. Reference is made to AR-700, 15 April 1979, DARCOM Supplement 1, 4 September 1979; and AMCCOM-R 10-17, 13 January 1986, Mission and Major Functions of USADACS.

C. OBJECTIVE. The objective of this test was to determine if the loading and bracing procedure with wooden dunnage in a commercial ISO side-opening container of 750-pound M117 bombs, complete round would satisfy the transportation requirements of Transportability Testing Procedure, TP-91-01. The following tests were conducted: rail, road hazard course, washboard course, and container tilt test.

D. CONCLUSION. This loading and bracing procedure satisfactorily retained the 750-pound M117 bombs and prevented damage to the container.

E. RECOMMENDATION. This procedure is recommended for approval for transportation of 750-pound M117 bomb complete rounds in all surface modes.

PART 2

12-13 and 15 July 1994

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PART 3

TEST PROCEDURES

These procedures were extracted from TP-91-01, Transportability Testing Procedures, July 1991, for tactical vehicles used for shipping munitions by tactical truck.

A. The test load was prepared using the outloading procedure specified for the munitions (see part 6). The 750-pound M117 bombs used in the load were inert (nonexplosive). The weight and physical characteristics of the load configuration were identical to the live (explosive) ammunition provided for in part 6; i.e., weights, physical dimensions, center of gravity (CG), etc. The ammunition packages duplicated live ammunition.

B. Tests for this load configuration are as follows:

1. Rail Impact Test (Test Method No. 1).
2. Road Hazard Course (Test Method No. 2).
3. Road Trip (Test Method No. 3).
4. Road Hazard Course (Test Method No. 2).
5. Washboard Course (Test Method No. 6).
6. Tilt Test (Test Method No. 5).

C. The test methods are as follows:

1. Test Method No. 1 (Rail Impact Test). The container load of 750-pound M117 bombs was positioned on a container chassis and securely locked in place using the twist locks at each corner. The container and/or chassis was secured to a TOFC/COFC. Equipment needed to perform the test included the TOFC/COFC (hammer) railcar, five empty railroad cars connected together to serve as the anvil, and a railroad locomotive. These anvil cars were positioned on a

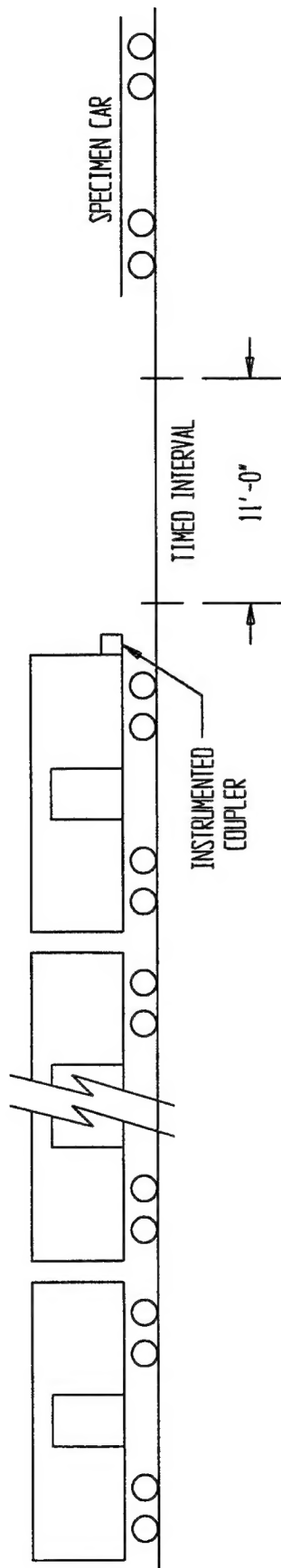
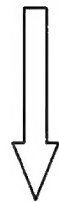
level section of track with air and hand brakes set with draft gears compressed. The locomotive unit pulled the TOFC/COFC several hundred yards away from the anvil cars, pushed the TOFC/COFC toward the anvil at a predetermined speed, then disconnected from the TOFC/COFC approximately 50 yards away from the anvil cars, which allowed it to roll freely along the track until it struck the anvil. This constituted an impact. Impacting is accomplished at speeds of 4, 6, and 8.1 mph in one direction and 8.1 mph in the opposite direction. The 4 and 6 mph impact speeds are approximate; the 8.1 mph speed is a minimum. Impact speeds are determined by using an electronic counter to measure the time required for the TOFC/COFC to traverse an 11-foot distance immediately prior to contact with the anvil cars (see figure 1, page 3-3).

2. Test Method No. 2 (Road Hazard Course). This step required the container load of 750-pound M117 bombs be placed on a container chassis and pulled over a 200-foot-long segment of concrete road which consisted of two series of railroad ties projecting 6-inches above the level of the road surface. The load traversed the course two times (see figure 2, page 3-5).

3. Test Method No. 3 (Road Trip). The chassis and container load of 750-pound M117 bombs were transported for a distance of 30 miles over a combination of roads surfaced with gravel, concrete, or asphalt. The test route included curves, corners, railroad crossings, cattle guards, and stops and starts. The load traveled at the maximum speed suitable for the particular road being traversed, except as limited by legal restrictions. No panic stops were performed since the test load was subjected to rail impact testing.

4. Test Method No. 6 (Washboard Course). Using a suitable tractor to pull the chassis, the container load of 750-pound M117 bombs was towed over the 300-foot-long washboard course

ASSOCIATION OF AMERICAN RAILROADS (AAR) STANDARD TEST PLAN



5 BUFFER CARS (ANVIL) WITH DRAFT GEAR
COMPRESSED AND AIR BRAKES IN A SET
POSITION
ANVIL CARS TOTAL WT 250,000 LBS (APPROX)

SPECIMEN CAR
IS RELEASED BY
SWITCH ENGINE TO
ATTAIN: IMPACT NO. 1 @ 4 MPH
IMPACT NO. 2 @ 6 MPH
IMPACT NO. 3 @ 8.1 MPH
THEN THE CAR IS REVERSED AND
RELEASED BY SWITCH ENGINE TO
ATTAIN: IMPACT NO 4. @ 8.1 MPH

FIGURE 1

(see figure 3, page 3-5) at a speed which produced the most violent response in the container load.

5. Test Method No. 5 (80 Degree Tilt Test). The container load of 750-pound M117 bombs was positioned on level terrain with the corner fittings resting on timbers so the entire container was supported by the corner fittings. The timbers were oriented parallel to the end rails of the container and extended 2 feet beyond the corner fittings on each side. Using one mobile crane and appropriate rigging, the container was rotated (tilted) using the bottom corner fittings as a fulcrum. The rigging (sling) was attached to the top corner fittings of the long side of the container. Tilting was accomplished by lifting the top corner fittings diagonally opposite the fulcrum. The crane boom was then positioned over the center of the container and the container was allowed to complete rotation to 80 degrees from where it started. The container was allowed to remain at the 80 degree tilt position for at least 1 minute, then the container was uprighted by reversing this procedure.

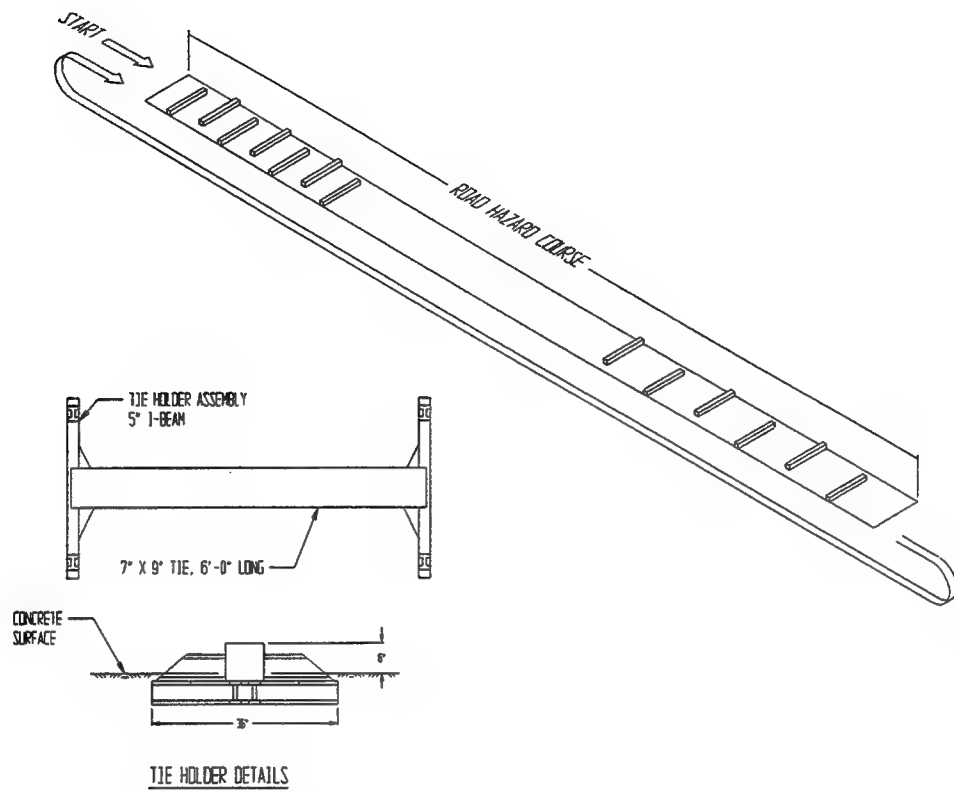


FIGURE 2

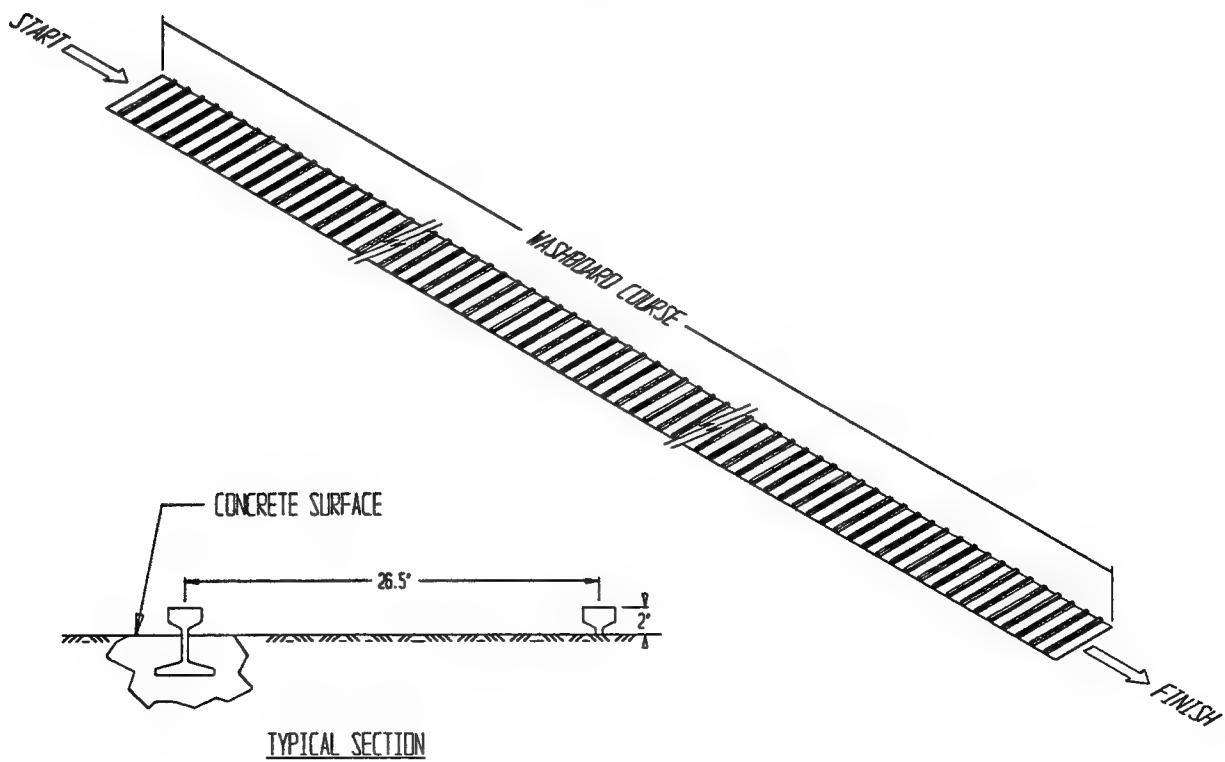


FIGURE 3

PART 4

TEST RESULTS

RAIL IMPACT DATA

Test No.: 1

Date: 12 July 1994

Specimen Load: 750-pound M117 bombs on wooden pallets, loaded and braced with wooden dunnage in a commercial ISO side-opening container, mounted on a COFC.

Flatcar No: TTWX 981118

Lt. Wt.: 70,200

Container Type: Side-opening No.: USAF0013995

Wt.: 6,050

Load Type: 750-pound M117 bombs, dunnage, fins

Wt.: 26,800

Container Type: IPF No. 9

Wt.: 8,700

Load Type: Combat Configured Load (CCL)

Wt.: 28,800

Total Specimen Wt.: 140,550

Buffer Car (five cars) Wt.: 250,000

| <u>Impact</u> | <u>End Struck</u> | <u>Velocity</u> | <u>Remarks</u> |
|---------------|-------------------|-----------------|--|
| 1 | Forward | 4.93 | No observed load movement. |
| 2 | Forward | 6.75 | No observed load movement. |
| 3 | Forward | 8.85 | No load movement in container load of 750-pound bombs. |
| 4 | Reverse | 8.34 | No load movement. |

RAIL IMPACT DATA

Test No.: 2

Date: 13 July 1994

Specimen Load: 750-pound M117 bombs on wooden pallets, loaded and braced with wooden dunnage in a commercial ISO side-opening container, chassis mounted on a TOFC.

Flatcar No: TTWX 981118

Lt. Wt.: 70,200

Container Chassis: ISCZ 164587

Wt.: 6,540

Container Type: Side-opening No.: USAF0013995

Wt.: 6,050

Load Type: 750-pound M117 bombs, dunnage, fins

Wt.: 26,800

Total Specimen Wt.: 109,590

Buffer Car (five cars) Wt.: 250,000

| <u>Impact</u> | <u>End Struck</u> | <u>Velocity</u> | <u>Remarks</u> |
|---------------|-------------------|-----------------|--|
| 1 | Reverse | 4.60 | No damage to load or container. |
| 2 | Reverse | 6.69 | No visual damage to load or container. |
| 3 | Reverse | 8.62 | No visual damage to load or container. |
| 4 | Forward | 8.98 | No visual damage to load or container. |

ROAD TEST DATA

Test No.: 3

Date: 13,15 July 1994

Specimen Load: 750-pound M117 bombs loaded in a commercial ISO side-opening container on a container chassis.

ROAD HAZARD COURSE:

| | | |
|---|----------|---------|
| PASS 1-A OVER FIRST SERIES OF TIES: | 6.25 SEC | 5.4 MPH |
| PASS 1-B OVER SECOND SERIES OF TIES: | 6.45 SEC | 5.1 MPH |
| REMARKS: No damage to container or load movement. | | |

| | | |
|---|----------|---------|
| PASS 2-A OVER FIRST SERIES OF TIES: | 6.47 SEC | 5.2 MPH |
| PASS 2-B OVER SECOND SERIES OF TIES: | 6.16 8EC | 5.3 MPH |
| REMARKS: No damage to container or load movement. | | |

30-MILE ROAD TEST: No damage or load movement.

PANIC STOP TEST: No panic stops were performed since the container load was previously subjected to four rail impact tests.

| | | |
|---|----------|---------|
| PASS 3-A OVER FIRST SERIES OF TIES: | 6.17 SEC | 5.5 MPH |
| PASS 3-B OVER SECOND SERIES OF TIES: | 5.65 SEC | 5.8 MPH |
| REMARKS: No damage to container or load movement. | | |

| | | |
|--|----------|---------|
| PASS 4-A OVER FIRST SERIES OF TIES: | 6.09 SEC | 5.6 MPH |
| PASS 4-B OVER SECOND SERIES OF TIES: | 6.31 SEC | 5.2 MPH |
| REMARKS: No visual lateral or vertical load or dunnage movement. | | |

WASHBOARD COURSE: No visual damage to the load or container.

80 DEGREE TILT TEST: No visual damage to the load or container.

PART 5

PHOTOGRAPHS



| | | |
|--|--|--|
| | U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL | |
| <p data-bbox="1304 212 1421 1877">PHOTO NO. DEV-9422-001. This photo shows a field combat-ready load on an EPF and the commercial ISO side-opening container of 750-pound M117 bombs on a COFC. This load was rail impacted at 4, 6, and 8.1 mph and 8.1 mph in reverse.</p> | | |



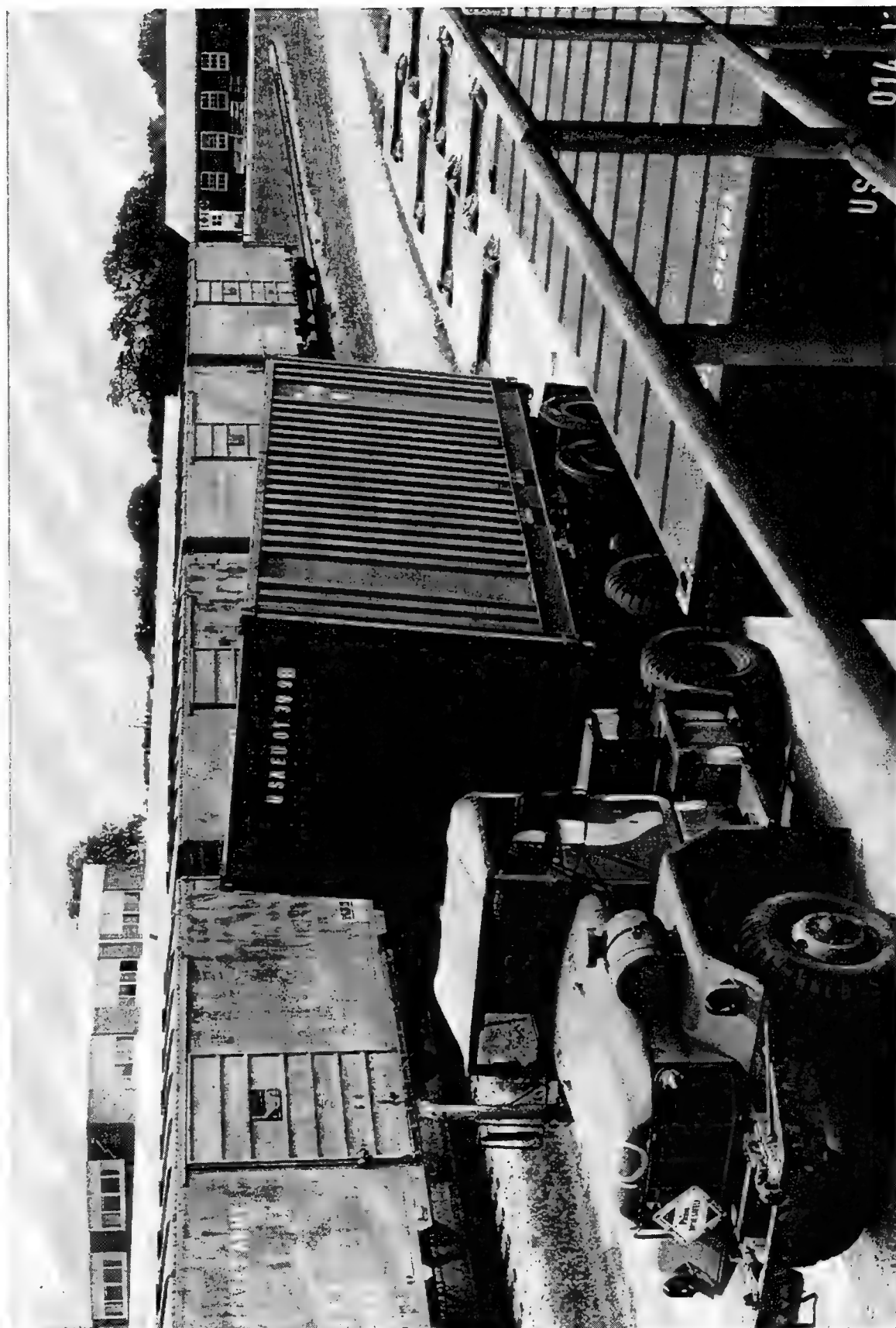
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PHOTO NO. DEV-9422-002. This load of 750-pound M117 bombs in a commercial ISO side-opening container on a TOFC was rail impacted at 4, 6, and 8.1 mph and 8.1 mph in reverse. No damage was observed in the load or container as a result of rail impact testing.



U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

PHOTO NO. DEV-9422-003. This photo shows a closeup view of the COFC load of 750-pound M117 bombs. This load is in the process of being rail impacted.



U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

PHOTO NO. DEV-9422-004. After rail impact tests, the 750-pound M117 bombs were subjected to the road course which is simulated by driving the load over alternating railroad ties. Movement velocity was approximately 5 mph.



U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

PHOTO NO. DEV-9422-005. After rail and road transportation tests, the lateral blocking is validated by tipping the container 80 degrees. Any shifting of the load as a result of this test is a failure. The load of 750-pound M117 bombs did not shift during this test.

PART 6

DRAWING

APPROVED BY
BUREAU OF EXPLOSIVES

DATE _____

LOADING AND BRACING* WITH WOODEN DUNNAGE IN SIDE OPENING ISO CONTAINERS OF M117 (750 POUND) BOMBS, COMPLETE ROUND

- * LOADING AND BRACING SPECIFICATIONS SET FORTH WITHIN THIS DRAWING ARE APPLICABLE TO LOADS THAT ARE TO BE SHIPPED BY TRAILER/CONTAINER-ON-FLATCAR (T/COFC) RAIL CARRIER SERVICE. THESE SPECIFICATIONS MAY ALSO BE USED FOR LOADS THAT ARE TO BE MOVED BY MOTOR OR WATER CARRIERS.

U.S. ARMY MATERIEL COMMAND DRAWING

APPROVED, U.S. ARMY ARMAMENT, MUNITIONS AND
CHEMICAL COMMAND

DRAFTSMAN

TECHNICIAN

ENGINEER

R. HAYNES

APPROVED BY ORDER OF COMMANDING GENERAL, U.S.
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SP15M7

DO NOT SCALE

PROJECT SP 273-93

GENERAL NOTES

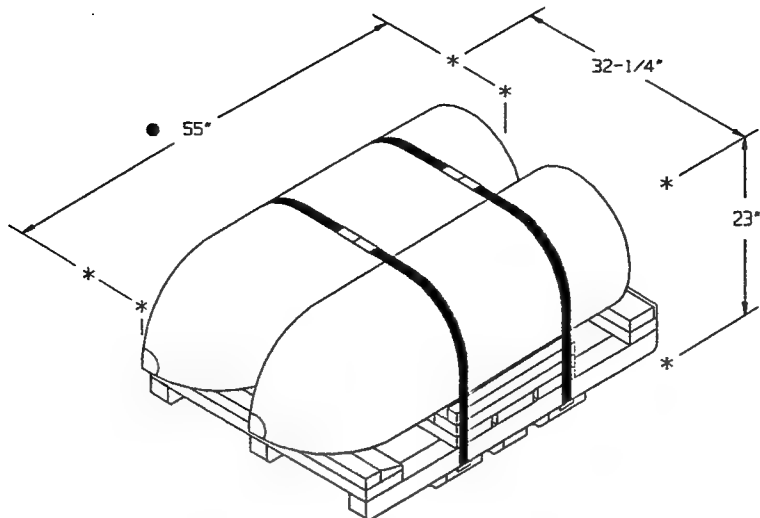
(GENERAL NOTES CONTINUED)

- A. THIS DOCUMENT HAS BEEN PREPARED AND ISSUED IN ACCORDANCE WITH AR 740-1 AND AUGMENTS TM 743-200-1 (CHAPTER 5).
- B. THE SPECIFIED OUTLOADING PROCEDURES ARE APPLICABLE TO LOADS OF M117 (750 POUND) BOMBS, COMPLETE ROUND. SEE PAGE 3 FOR DETAILS OF THE ITEMS TO BE SHIPPED. CAUTION: REGARDLESS OF THE QUANTITY OF CONTAINERS TO BE SHIPPED, THE "MAXIMUM GROSS WEIGHT" OF THE SIDE OPENING ISO CONTAINER MUST NOT BE EXCEEDED.
- C. THE LOAD AS SHOWN IS BASED ON A 6,050 POUND 20' LONG BY 8' WIDE BY 8'-6" HIGH SIDE OPENING INTERMODAL CONTAINER WITH INSIDE DIMENSIONS OF 19'-4" LONG BY 89" WIDE BY 88" HIGH. THE LOAD IS DESIGNED FOR TRAILER/CONTAINER-ON-FLAT-CAR (T/COFC) SHIPMENT, HOWEVER, THE LOAD AS DESIGNED CAN ALSO BE MOVED BY OTHER SURFACE MODES OF TRANSPORT. NOTICE: OTHER CONTAINERS OF THE SAME DESIGN CONFIGURATION CAN BE USED.
- D. WHEN LOADING CONTAINERS, THEY ARE TO BE POSITIONED SO AS TO ACHIEVE A TIGHT LOAD (TIGHT AGAINST THE DUNNAGE ASSEMBLIES). ALTHOUGH A TOTAL OF 1-1/2" OF UNBLOCKED SPACE ACROSS THE WIDTH OF A LOAD BAY IS PERMITTED, LATERAL VOIDS WITHIN THE LOAD ARE TO BE HELD TO A MINIMUM. EXCESSIVE SLACK CAN BE ELIMINATED FROM A LOAD BY LAMINATING ADDITIONAL PIECES OF APPROPRIATE THICKNESS TO THE HORIZONTAL PIECES ON THE CENTER GATE ASSEMBLY. NAIL EACH ADDITIONAL PIECE W/1 APPROPRIATELY SIZED NAIL EVERY 12". ADDITIONALLY, THE THICKNESS AND/OR QUANTITY OF THE VERTICAL AND HORIZONTAL PIECES IN THE CENTER GATE ASSEMBLY MAY BE ADJUSTED AS REQUIRED TO FACILITATE VARIANCE IN THE CONTAINER SIZE.
- E. DUNNAGE LUMBER SPECIFIED IS OF NOMINAL SIZE. FOR EXAMPLE, 1" X 4" MATERIAL IS ACTUALLY 3/4" THICK BY 3-1/2" WIDE AND 2" X 8" MATERIAL IS ACTUALLY 1-1/2" BY 5-1/2" WIDE.
- F. A STAGGERED NAILING PATTERN WILL BE USED WHENEVER POSSIBLE WHEN NAILS ARE DRIVEN INTO JOINTS OF DUNNAGE ASSEMBLIES OR WHEN LAMINATING DUNNAGE. ADDITIONALLY, THE NAILING PATTERN FOR AN UPPER PIECE OF LAMINATED DUNNAGE WILL BE ADJUSTED AS REQUIRED SO THAT A NAIL FOR THAT PIECE WILL NOT BE DRIVEN THROUGH ONTO OR RIGHT BESIDE A NAIL IN A LOWER PIECE.
- G. IN SOME CONTAINERS THERE IS A SLOT AT THE CORNERS OF THE ENDWALLS. PIECES OF DUNNAGE MATERIAL MUST BE LAMINATED TO THE BUFFER PIECES ON THE END BLOCKING ASSEMBLIES TO PROVIDE A FLAT SURFACE FOR THE BUFFER PIECES. A PIECE OF 2" X 4", 2" X 3" OR A SPECIAL WIDTH PIECE CUT-TO-FIT CAN BE USED. THIS FILL PIECE WILL BE NAILED WITH ONE APPROPRIATELY SIZED NAIL EVERY 12". THIS PIECE IS NOT REQUIRED WHEN THE CORNER PORTIONS OF THE CONTAINER ENDWALLS ARE SMOOTH AND FLAT.
- H. CAUTION: DO NOT NAIL DUNNAGE MATERIAL TO THE CONTAINER WALLS OR FLOOR. ALL NAILING WILL BE WITHIN THE DUNNAGE.
- J. PORTIONS OF THE CONTAINER DEPICTED WITHIN THIS DRAWING, SUCH AS THE SIDE DOORS, HAVE NOT BEEN SHOWN IN THE LOAD VIEWS FOR CLARITY PURPOSES.
- K. REQUIREMENTS CITED WITHIN THE BUREAU OF EXPLOSIVES PAMPHLET 6C APPLY WHEN THE SHIPMENT MOVES BY TRAILER/CONTAINER-ON-FLAT-CAR (T/COFC). SPECIAL T/COFC NOTES FOLLOW:
1. A LOADED CONTAINER MUST BE ON A CHASSIS EQUIPPED WITH TWO BOGIE ASSEMBLIES WHEN BEING MOVED IN TOFC SERVICE.
 2. THE LOAD LIMIT OF A T/COFC RAILCAR MUST NOT BE EXCEEDED, NOR WILL A CAR BE LOADED SO THAT THE TRUCK UNDER ONE END OF THE CAR CARRIES MORE THAN ONE-HALF OF THE LOAD LIMIT FOR THAT CAR.
- L. DURING INTRASTATE AND/OR INTERSTATE MOVES BY MOTOR CARRIER, A PROPER CHASSIS OR MODIFIED FLATBED TRAILER MUST BE USED TO PRECLUDE VIOLATION OF ONE OR MORE "WEIGHT LAWS" APPLICABLE TO THE STATE OR STATES INVOLVED.
- M. CONVERSION TO METRIC EQUIVALENTS: DIMENSIONS WITHIN THIS DOCUMENT ARE EXPRESSED IN INCHES AND WEIGHTS ARE EXPRESSED IN POUNDS. WHEN NECESSARY, THE METRIC EQUIVALENTS MAY BE COMPUTED ON THE BASIS OF ONE INCH EQUALS 25.4MM AND ONE POUND EQUALS 0.454KG.
- N. WHEN STEEL STRAPPING IS SEALED AT AN END-OVER-END LAP JOINT, A MINIMUM OF ONE SEAL WITH TWO PAIR OF NOTCHES WILL BE USED TO SEAL THE JOINT WHEN A NOTCH-TYPE SEALER IS BEING USED. A MINIMUM OF TWO SEALS, BUTTED TOGETHER WITH TWO PAIR OF CRIMPS PER SEAL WILL BE USED TO SEAL THE JOINT WHEN A CRIMP-TYPE SEALER IS BEING USED. REFER TO THE "STRAP JOINT A" AND "STRAP JOINT B" DETAILS ON PAGE 9.

(CONTINUED AT RIGHT)

MATERIAL SPECIFICATIONS

| | |
|------------------|---|
| LUMBER | ---: SEE TM 743 200 1 (DUNNAGE LUMBER) AND FED SPEC MM-L-751. |
| NAILS | ---: FED SPEC FF-N-105; COMMON. |
| PLYWOOD | ---: COMMERCIAL ITEM DESCRIPTION A-A-55057, TYPE A, CONSTRUCTION AND INDUSTRIAL PLYWOOD, INTERIOR WITH EXTERIOR GLUE, GRADE C-D. IF SPECIFIED GRADE IS NOT AVAILABLE, A BETTER INTERIOR OR AN EXTERIOR GRADE MAY BE SUBSTITUTED. |
| STRAPPING, STEEL | ---: ASTM D3953; FLAT STRAPPING, TYPE I, HEAVY DUTY, FINISH A, B, (GRADE 2), OR C. |
| SEAL, STRAP | ---: ASTM D3953; CLASS H, FINISH A, B (GRADE 2), OR C, DOUBLE NOTCH TYPE, STYLE I, II, OR IV. |

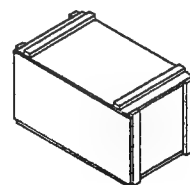
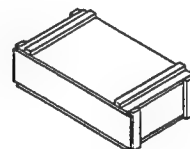
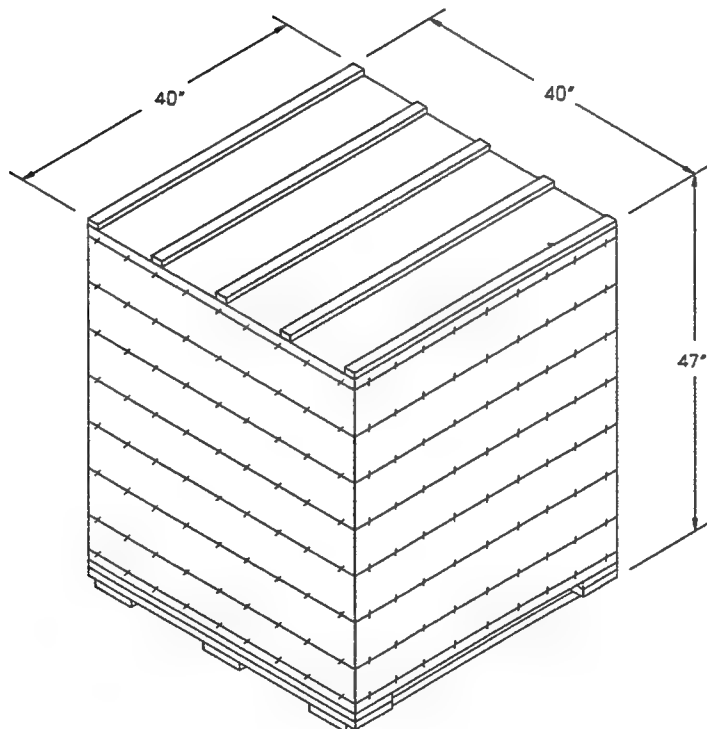


750 POUND, M117

FOR DETAILS OF THE PALLET UNIT
SEE AIR FORCE TPO 1325-926-1868.

GROSS WEIGHT - 1,540 TO 1,575 LBS (APPROX)

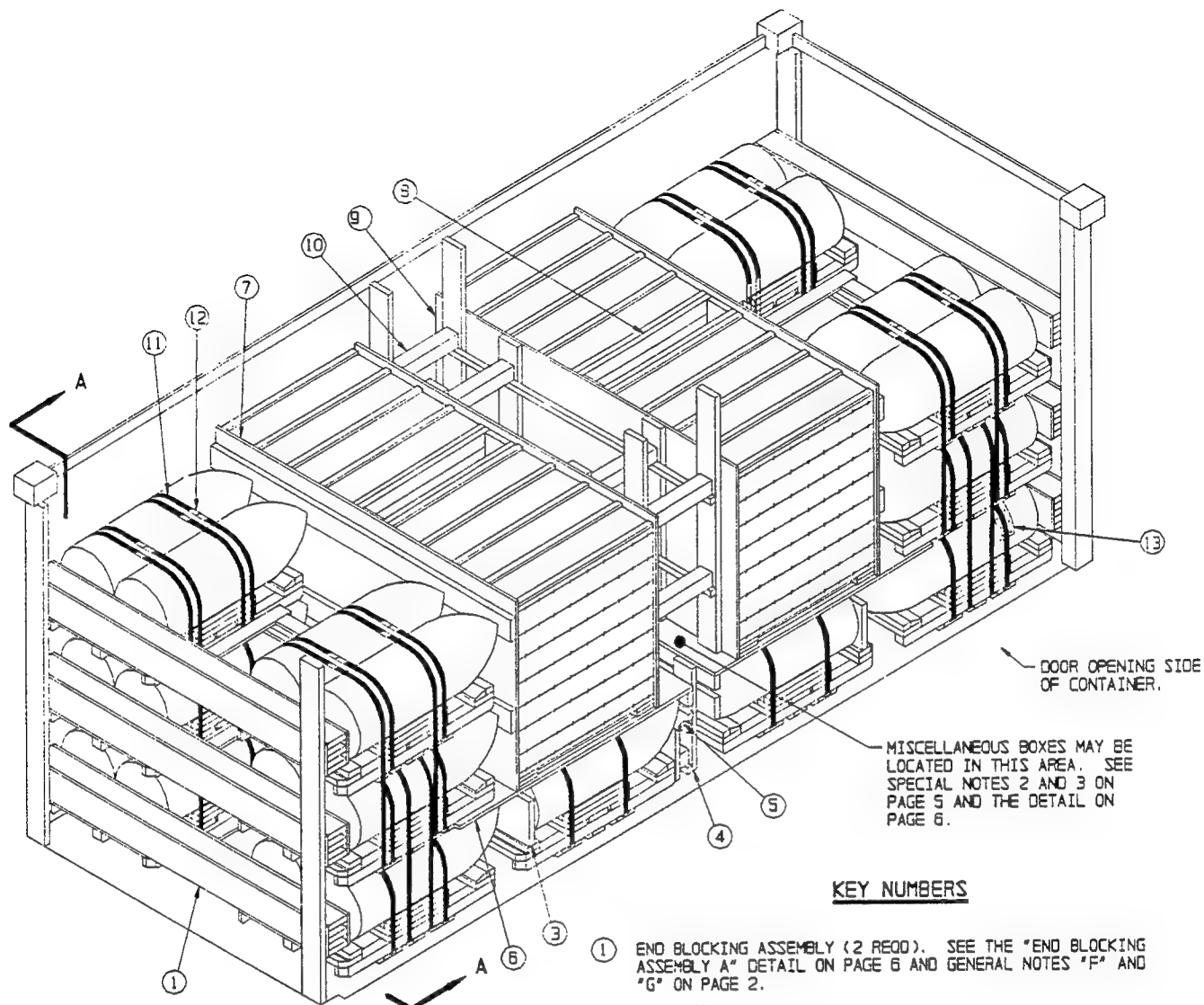
- UNIT LENGTH FOR BOMBS EQUIPPED WITH CONICAL NOSE PLUGS IS 55". UNIT LENGTH FOR BOMBS EQUIPPED WITH FLAT TYPE NOSE PLUGS IS 52-1/4".



TYPICAL COMPONENT BOXES
VARIOUS SIZES AND WEIGHTS.

FIN ASSEMBLY, MAU-91

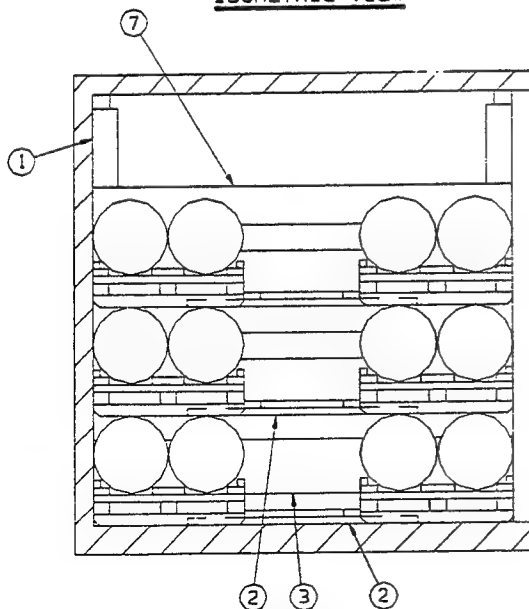
FOR DETAILS OF THE WIREBOUND BOX
SEE AIR FORCE TO 11A6-10-7.



KEY NUMBERS

- ① END BLOCKING ASSEMBLY (2 REQD). SEE THE "END BLOCKING ASSEMBLY A" DETAIL ON PAGE 6 AND GENERAL NOTES "F" AND "G" ON PAGE 2.
- ② ANTI-SWAY BRACE (8 REQD). SEE THE DETAIL ON PAGE 8 AND SPECIAL NOTE 4 ON PAGE 5.
- ③ BUFFER PIECE, 2" X 12" BY INSIDE CONTAINER WIDTH MINUS 1" (REF: 7'-4") (2 REQD). POSITION ON EDGE ON THE AFT END STOP PIECE OF THE BOMB PALLET AS SHOWN.
- ④ CENTER GATE (2 REQD). SEE THE "CENTER GATE A" DETAIL ON PAGE 5. SEE GENERAL NOTE "D" ON PAGE 2.
- ⑤ STRUT, 4" X 4" BY CUT TO FIT (REF: 17") (8 REQD). POSITION SO AS TO BE BETWEEN THE CENTER GATES, PIECES MARKED ④. TOENAIL TO THE CENTER GATES W/2-16d NAILS AT EACH END.
- ⑥ DECKING, PLYWOOD, 1/2" THICK BY 44" WIDE BY LENGTH TO SUIT (4 REQD). POSITION ON TOP OF THE BOMB PALLET UNITS AND CENTER GATES AS SHOWN.
- ⑦ SEPARATOR GATE (2 REQD). SEE THE DETAIL ON PAGE 7. POSITION WITH THE HORIZONTAL PIECES AGAINST THE BOMBS.
- ⑧ CRIB FILL (2 REQD). SEE THE DETAIL ON PAGE 9. POSITION BETWEEN THE BOXES CONTAINING THE BOMB FINS.
- ⑨ CENTER GATE (2 REQD). SEE THE "CENTER GATE B" DETAIL ON PAGE 7.
- ⑩ STRUT, 4" X 4" BY CUT TO FIT (REF: 38-1/2") (8 REQD). POSITION SO AS TO BE BETWEEN THE CENTER GATES, PIECES MARKED ⑨. TOENAIL TO THE CENTER GATES W/2-16d NAILS AT EACH END.

ISOMETRIC VIEW



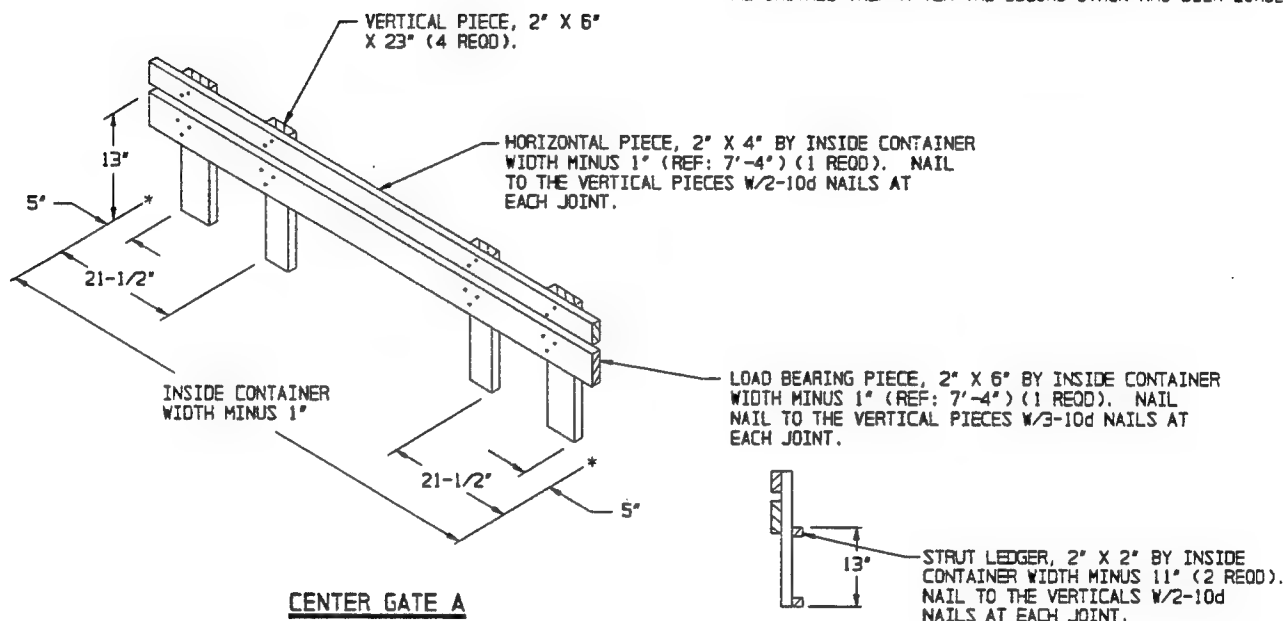
SECTION A-A

(CONTINUED ON PAGE 5)

- ⑪ UNITIZING STRAP, 1-1/4" X .035" OR .031" X 14'-0" LONG STEEL STRAPPING (16 REQD). INSTALL SO AS TO ENIRCLE THE LOWER TWO PALLET UNITS AND/OR TOP TWO PALLET UNITS WITH TWO STRAPS EACH AS SHOWN.
- ⑫ SEAL FOR 1-1/4" STEEL STRAPPING (16 REQD, 1 PER STRAP). CRIMP EACH SEAL WITH TWO PAIR OF NOTCHES. SEE GENERAL NOTE "N" ON PAGE 2.
- ⑬ ANTI-CHAFING MATERIAL (AS REQD). POSITION UNDER ALL STEEL STRAPPING AT POINTS OF CONTACT WITH THE BOMB BODIES.

SPECIAL NOTES:

1. THE LOAD AS SHOWN ON PAGE 4 DEPICTS A COMPLETE ROUND LOAD OF 750 POUND M117 BOMBS, INCLUDING 16 PALLETS OF BOMBS, 4 WIREBOUND CRATES WITH MAU-91 FINS, AND NUMEROUS BOXES CONTAINING MISCELLANEOUS ITEMS SUCH AS FUZES, ADAPTORS, AND COUPLERS.
2. WHEN INSTALLING THE DUNNAGE THAT APPLIES TO THE MISCELLANEOUS BOXES, ADJUSTMENTS TO THE QUANTITY AND SIZE OF MATERIAL MAY BE ADJUSTED AS NECESSARY.
3. MISCELLANEOUS BOXES MAY ALSO BE PLACED IN OTHER VOID AREAS WITHIN THE LOAD, SUCH AS BETWEEN THE CENTER GATES "A" OR BETWEEN LATERALLY ADJACENT LOAD UNITS OF BOMB PALLETS.
4. FLOOR LINE BLOCKING ASSEMBLIES SHOULD BE PLACED INTO POSITION PRIOR TO LOADING THE SECOND STACK WITHIN A LOAD UNIT, WHEREAS IT WILL BE EASIER TO PARTIALLY FABRICATE THE SECOND AND THIRD LAYER ANTI-SWAY BRACES AND INSTALL THEM AFTER THE SECOND STACK HAS BEEN LOADED.



END VIEW

| BILL OF MATERIAL | | |
|--|-------------|------------|
| LUMBER | LINEAR FEET | BOARD FEET |
| 1" X 4" | 53 | 18 |
| 2" X 2" | 39 | 13 |
| 2" X 4" | 163 | 109 |
| 2" X 6" | 236 | 236 |
| 2" X 12" | 15 | 30 |
| 4" X 4" | 25 | 33 |
| NAILS | NO. REQD | POUNDS |
| 6d (2") | 88 | 1/2 |
| 8d (2-1/2") | 308 | 3 |
| 10d (3") | 216 | 3 |
| 16d (3-1/2") | 48 | 1 |
| STEEL STRAPPING, 1-1/4" -- 224' REQD -- 32 LBS | | |
| SEAL FOR 1-1/4" STRAPPING -- 16 REQD -- 1 LB | | |
| PLYWOOD, 1/2" -- 60 SQ FT REQD -- 124 LBS | | |
| PLYWOOD, 3/4" -- 88 SQ FT REQD -- 121 LBS | | |
| ANTI-CHAFING MATERIAL -- AS REQD -- NIL | | |

TYPICAL ITEMS AS DEPICTED WITHIN THIS DRAWING

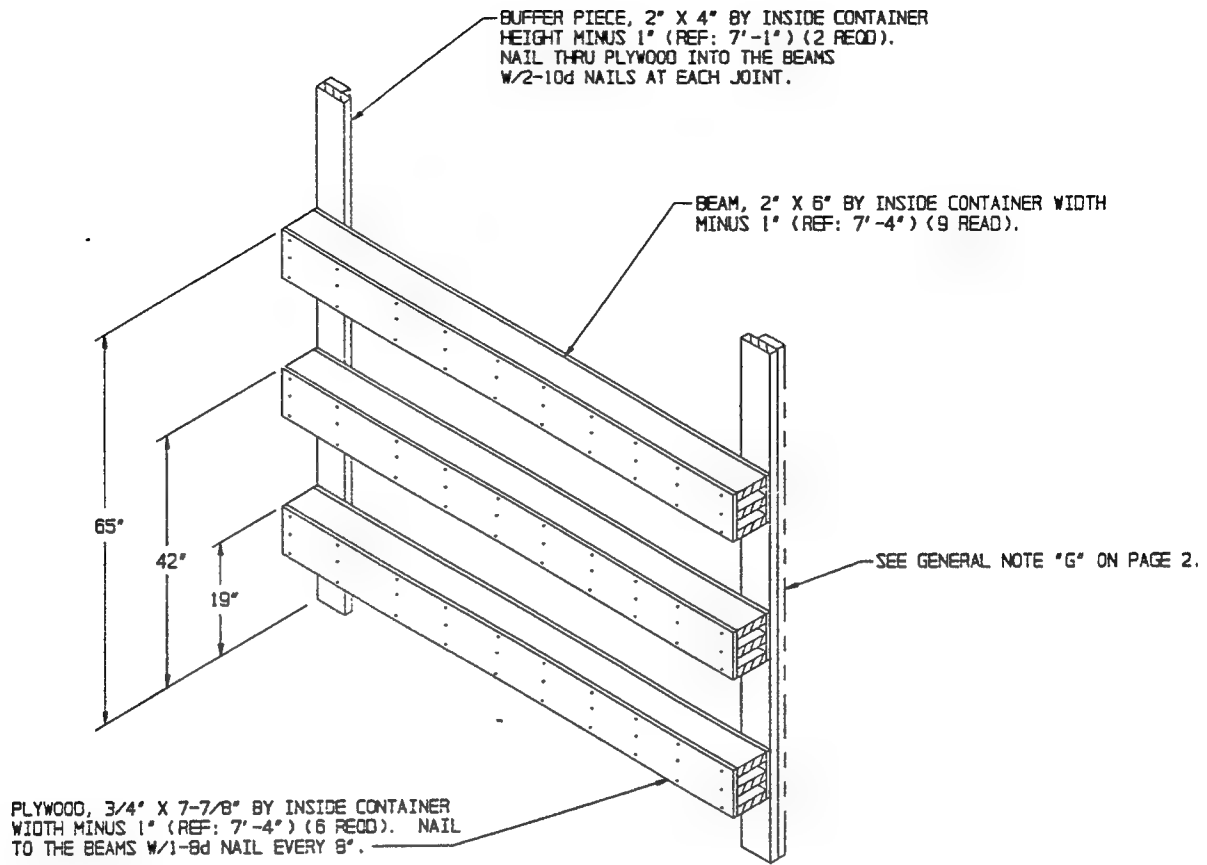
| DDIC | NOMENCLATURE | QUANTITY |
|------|--------------------|----------|
| F114 | M-117 BOMB, 750 LB | 32 |
| F672 | MAU-91 FIN | 16 |
| F835 | M904 FUZE | 2 * |
| G119 | FUZE FMU 139 | 6 * |
| F372 | ADAPTOR T4SE7 | 2 * |
| M212 | FUZE M-9 | 1 * |
| OY42 | STRAP | 1 * |

* INDICATES NUMBER OF BOXES.

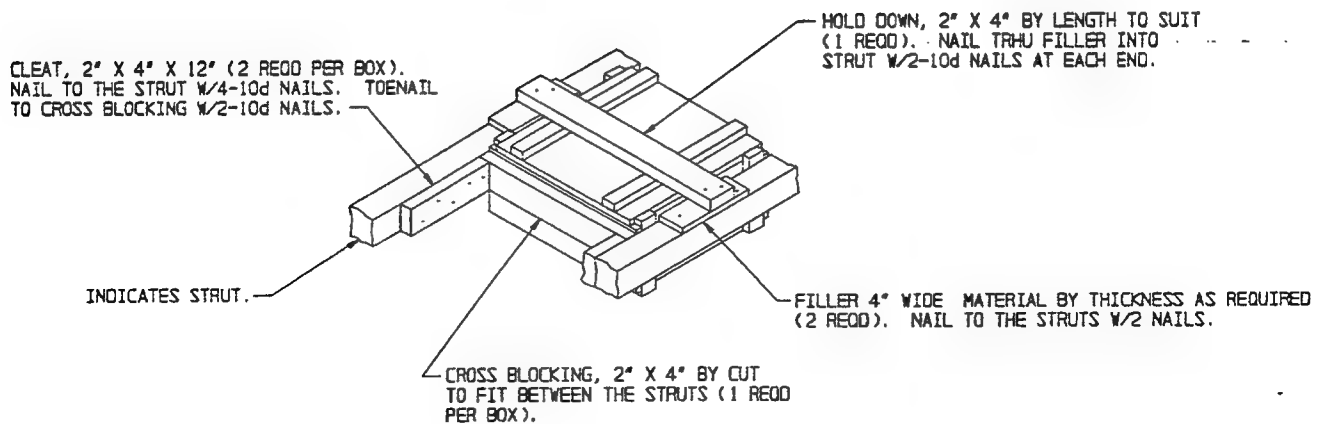
LOAD AS SHOWN

| ITEM | QUANTITY | WEIGHT (APPROX) |
|---------------------|----------|-----------------|
| BOMB PALLET UNIT | 16 | 24,640 LBS |
| MAU-91 FIN | 4 | 615 LBS |
| MISCELLANEOUS BOXES | AS REQD | 400 LBS |
| DUNNAGE | | 1,164 LBS |
| CONTAINER | | 6,050 LBS |

TOTAL WEIGHT -- 32,869 LBS (APPROX)



END BLOCKING ASSEMBLY



SECUREMENT OF MISCELLANEOUS BOXES

VERTICAL PIECE, 2" X 6" X 65" (2 REQD).

VERTICAL PIECE, 2" X 6" X 48" (2 REQD).

LOAD BEARING PIECE, PLYWOOD, 3/4" THICK BY 48" WIDE BY INSIDE CONTAINER LENGTH MINUS 1" (REF: 7'-4") (1 REQD). NAIL TO THE VERTICAL PIECES W/6-8d NAILS AT EACH LOCATION.

STRUT LEDGER, 2" X 2" X LENGTH TO SUIT (2 REQD). NAIL TO THE VERTICAL PIECES W/2-10d NAILS AT EACH JOINT.

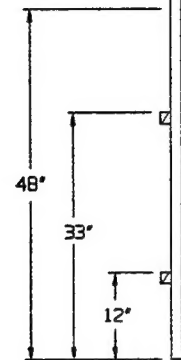
5-1/4"

21-1/2"

INSIDE CONTAINER WIDTH MINUS 1"

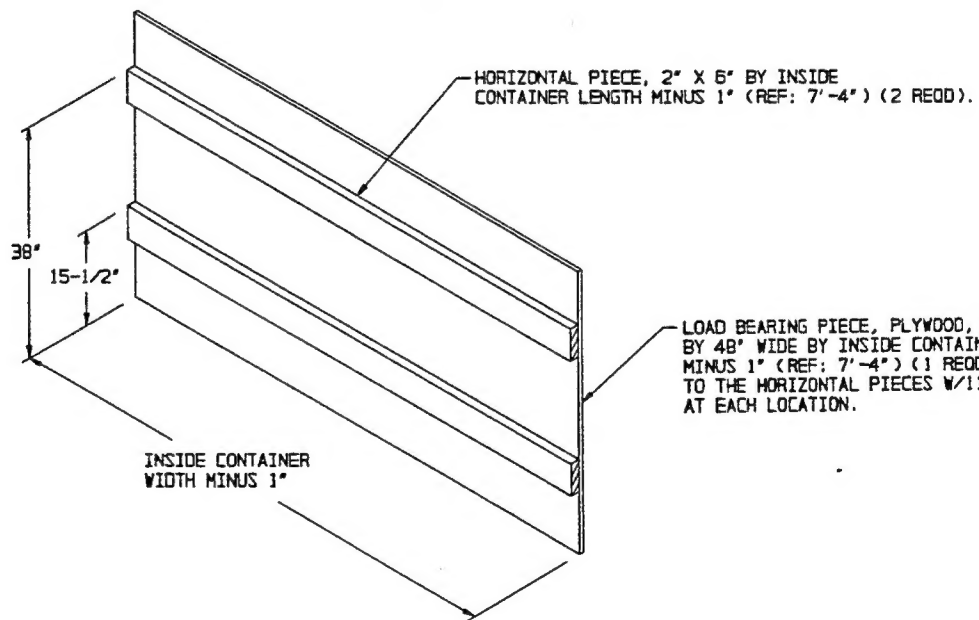
21-1/2"

5-1/4"

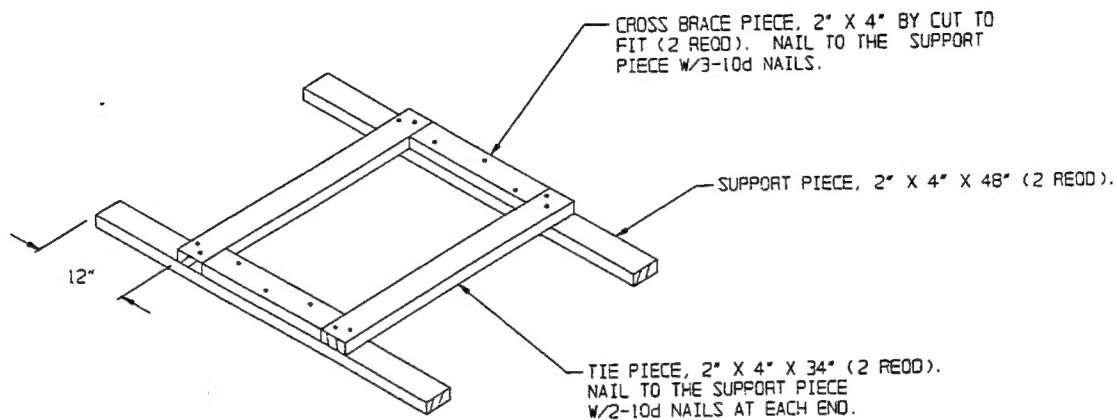


END VIEW

CENTER GATE B

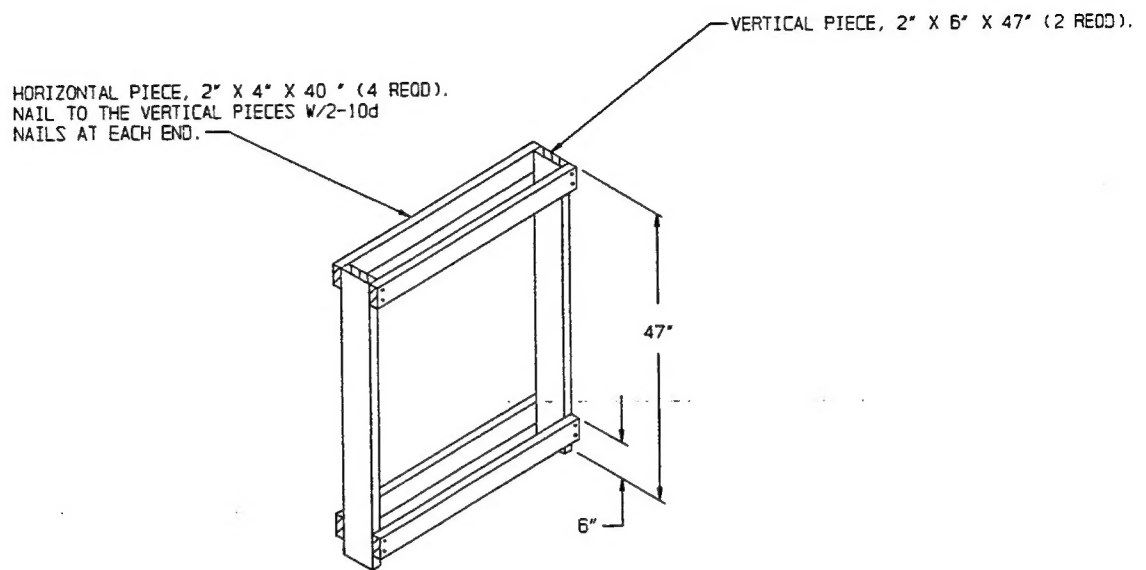


SEPARATOR GATE

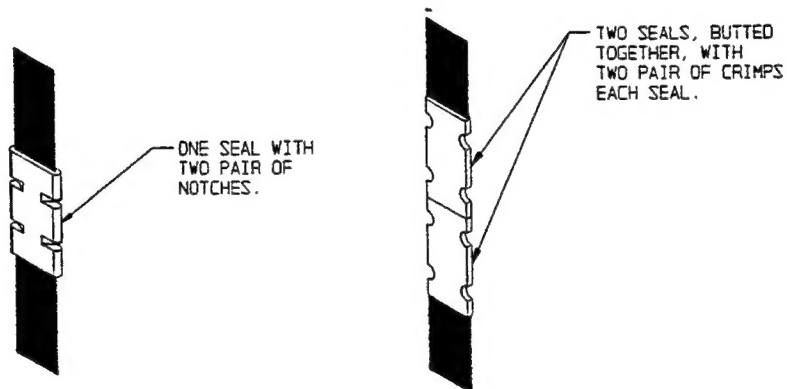


ANTI-SWAY BRACE

PARTIALLY ASSEMBLE THE ANTI-SWAY BRACE BY NAILING ONE TIE PIECE TO THE SUPPORT PIECES. AFTER ONE PALLET UNIT HAS BEEN POSITIONED IN THE LOAD UNIT LAYER IN WHICH THE ANTI-SWAY BRACE IS TO BE USED, INSERT THE LONG ENDS OF THE SUPPORT AND RISER PIECES SO AS TO EXTEND BETWEEN THE OUTER DECK BOARDS OF THE PALLET. SLIDE THE PARTIAL ASSEMBLY IN UNDER THE BOARDS ON THE PALLET UNIT. POSITION THE OTHER PALLET UNIT. PULL THE PARTIAL ASSEMBLY OUT AND INSERT THE SHORT END OF THE SUPPORT AND RISER PIECES UNDER THE LAST PALLET SO THE TIE PIECE BEARS AGAINST THE NOSE END STOP AND THE AFT END STOP PIECES. POSITION THE REMAINING TIE PIECE AGAINST THE FIRST PALLET UNIT AND NAIL IN PLACE. THEN NAIL THE TWO CROSS BRACE PIECES TO THE SUPPORT PIECES AS SHOWN.



CRIB FILL



STRAP JOINT A

METHOD OF SECURING A
STRAP JOINT WHEN USING
A NOTCH-TYPE SEALER.

STRAP JOINT B

METHOD OF SECURING A
STRAP JOINT WHEN USING
A CRIMP-TYPE SEALER.

END-OVER-END LAP JOINT DETAILS

